Image courtesy of SOTEPA

PowerCivil for Middle East

Proven Technology for Designing and Sustaining Transportation Infrastructure

Bentley PowerCivil for Middle East provides information-rich modelling integrated with CAD, mapping, GIS, and business tools such as PDFs, i-models and hypermodels. The software features immersive, 3D parametric modelling with an innovative approach to designing civil components in a total project context. PowerCivil for Middle East is the design platform of choice for leading engineering design firms and transportation agencies. Discover why transportation professionals depend on PowerCivil for Middle East.

Powered by OpenRoads

OpenRoads is the underlying technology for Bentley civil engineering design products (GEOPAK, InRoads, MXROAD, and PowerCivil) that expands design boundaries by providing 3D modelling, design-time visualisation, design intent, information mobility, and construction-driven engineering in a single application. OpenRoads technology preserves user equity in standards, deliverables, and legacy data while providing information modelling to drive intelligent infrastructure.

Information Modelling

Bentley understands the demands on engineers and designers to produce models that provide information beyond documentation and construction, into operations, maintenance, and rehabilitation — and back to design if necessary. Using PowerCivil for Middle East, the modelling process can start at the beginning of the project, resulting in intelligent 3D models that allow users to conduct preliminary analysis of the design and visualise the design in real-time, ensuring accuracy and reducing project costs. Model centric, integrated designs ensure that any changes made in the design are dynamically updated throughout the model, guaranteeing that the current design is readily available for all team members.

Information modelling expands the boundaries of simple 2D or 3D geometric representations of a design by including the opportunity to capture and incorporate into the model all design related information. The resulting intelligent model enables users to make more informed and better high impact decisions earlier in the design process with better, more complete conceptual designs; eliminate errors and omissions in the documentation process by having fully synchronised documentation from the model; explore and analyse many options to maximise the performance of the asset in the real world; and to reuse information to improve construction, operation and maintenance of the asset.

Advanced Design

PowerCivil for Middle East is used for roads and highways, railways, and public works projects as well as commercial, industrial, and environmental land development. Sophisticated design tools that use modelling process rules, relationships and constraints enable the model to react to design changes and anticipate the engineer's design intent.

PowerCivil for Middle East pushes the design envelope with the advent of civil cells, which make the use of wizards a tool of the past. Civil cells enable users to preconfigure commonly used 2D and 3D geometric layouts while maintaining all design, constraint and relational intelligence. Civil cells can then be continually used in designs to ensure standards are implemented, increase design quality and eliminate the need to repeatedly design common configurations.

Ensure Engineering Intent

PowerCivil for Middle East's design intent capabilities enable users to build associations and relationships between civil elements to ensure the design project is reflective of engineering intent. Object information (how, where, and by what method it was created) is stored with each object to insure the original intent is retained and honoured in the design. If an element is modified any related elements are automatically updated based on these stored relationships.
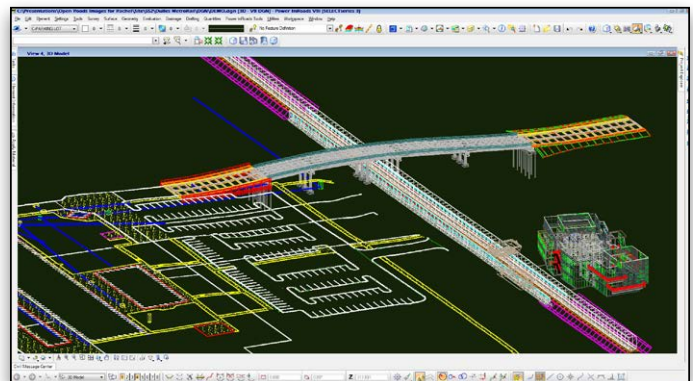
Includes excellent tools for commercial industrial land development as well as environmental remediation.

Project Versatility

Extremely versatile, PowerCivil for Middle East is used for all types and phases of civil projects, large and small, by users of every level of expertise. The software integrates every aspect of the civil project, from corridor studies to final design

PowerCivil for Middle East features intelligent, intuitive 3D information modelling for the full lifecycle of civil and transportation projects.

and production of construction deliverables. It handles a wide variety of complex tasks such as junction design, roundabout design, survey data reduction, site development, sanitary and stormwater network design and production of construction staking reports.

Flexible and Configurable

PowerCivil for Middle East delivers all the drafting and drawing production capabilities of MicroStation® within a single application. The strengths of Power PowerCivil for UK & Ireland are enhanced by Civil AccuDraw, the civil-specific version of MicroStation AccuDraw® – an intuitive, precision drafting tool that anticipates the user's intent, reducing the number of mouse clicks and other actions required to achieve drafting tasks. Civil AccuDraw streamlines the drafting process by supporting civil specific drafting conventions with options for station and offsets, bearings and distances, azimuths and more.

Because workflows can vary widely depending on the scope of the project, PowerCivil for Middle East offers users the flexibility to work in ways that best suit their specific needs. The software is fully configurable, enabling users to customise the PowerCivil for Middle East environment to meet project standards or personal preferences. Roadway libraries streamline repetitive tasks across projects and promote rapid evaluation of design alternatives for critical decision making. PowerCivil for Middle East automates the production of a complete array of design deliverables. Embedded project management capabilities help users stay on top of all project components and deliverables – capabilities that are tightly integrated with Bentley's ProjectWise® system of collaboration servers and services for engineering information and project collaboration.

Complete Drafting, Visualisation, and Publishing

PowerCivil for Middle East contains all the powerful creation, editing, viewing, visualisation and publishing capabilities of MicroStation, Bentley's flagship product, in a single, powerful civil design application. Whether placing simple CAD graphics, labelling and detailing plans for final production, or providing a walk through of a rendered design model, PowerCivil for Middle East does it all. The software also supports over 50 raster formats, including many geo-referenced formats, to aid engineers and designers in creating designs and solving engineering challenges. Because no project is complete until the results are published, PowerCivil for Middle East
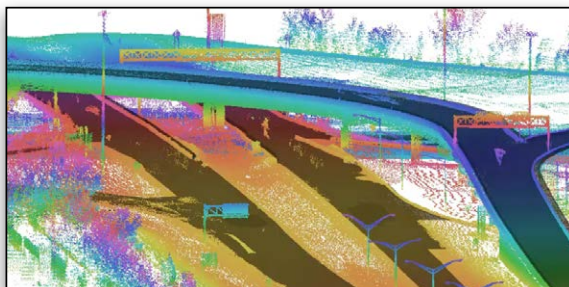
includes capabilities to print and plot to popular devices, specify plot variables for size, scale and symbology and publish to Adobe PDF – including 3D PDF.
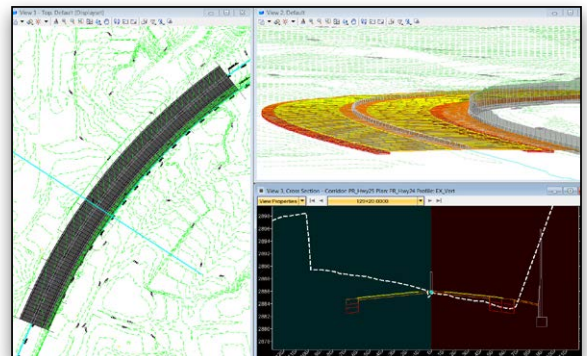
Working With Field Data

An all-in-one solution, PowerCivil for Middle East excels at data acquisition enabling users to work with any field data available for their design or survey projects. From photogrammetry and total station surveys to GPS, LiDAR and point clouds, the software can upload, analyse and manipulate field data while ensuring the provenance of the original data. The software supports the leading devices and formats, handling a broad array of existing topographic information. Adjustments are calculated using any of the industry-standard methods. Users can modify and process the data as needed and when the design is complete, upload design data to data collectors for stakeout or automated machine guidance for site preparation.

Integrated Mapping

PowerCivil for Middle East contains a comprehensive set of mapping and GIS data compilation and editing tools. These tools allow the engineer to combine engineering and GIS data for better decision processing in preliminary design, account for sensitive issues like wetland mitigation and even publish maps for public approvals. The design process expands to enforce business and topological rules and adhere to administrative restrictions. By combining engineering and mapping tools, Bentley brings CAD and engineering design accuracy, ease of use, and efficiency to GIS. Overall, users make better-informed decisions through analysis, visualisation, and presentation and better communicate through stunning maps and intelligent PDFs.
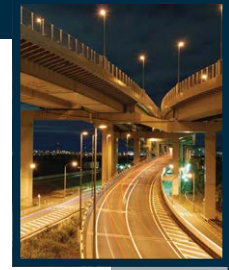
Feature-based Surface Modelling

PowerCivil for Middle East enables users to create intelligent models containing not only terrain data but also roadway or site features. Features are visually distinguished by structure, appearance, and symbology. The software uses triangulated surfaces to represent terrain – for both existing ground and proposed design. Intelligent digital terrain modelling (DTM) lets users incorporate features such as roadway centerlines, pavement edges, or ditches in the surface

PowerCivil for Middle East can incorporate an unmatched range of point cloud data of any scale to provide context for designs and accelerate the design process.

Combine plan, profile, and cross-section workflows with innovative 3D modelling technology and the result is immersive modelling.

model. These can be random features for non-uniformly occurring points or breaklines that represent features connected in linear segments – as in the case of ridges, edges of pavement and kerbs. Interior voids or holes represent building footprints, lakes and so on. In addition other topographical features are represented in the 3D model, including utilities (both above and below ground), buildings, pads or any topological data collected.

Flexible Geometry Creation

The full complement of coordinate geometry (COGO) and advanced alignment design capabilities of PowerCivil for Middle East enable fast creation of precision horizontal and vertical alignments as the three dimensional roadway is developed. Elevation profiles display surface information as well as vertical alignments associated with horizontal alignments. A combined, true 3D alignment constructed from the horizontal and vertical definitions can be displayed. The software supports unrestricted viewing with unlimited geometry editing and manipulation either graphically or with precision key-in. A check integrity capability locates and allows removal of discontinuities and highlights other potential issues such as non-tangential curves for resolution/correction.

In-context Road Design

PowerCivil for Middle East provides in-context, smart design of 3D road corridors with intelligent corridor modelling tools. The software streamlines the complex development of every aspect of the roadway in a single, parametric presentation. Users can move rapidly along a corridor at controlled intervals, viewing and dynamically designing all roadway components in concert. The software automatically computes dynamic volumes to balance cut and fill.

Use immersive modelling with parametric design tools to dynamically view the design in plan, profile, cross section and superelevation. Users see immediate visual feedback in all views as the work progresses. The roadway is easily modified by direct manipulation of parametric graphical components or by precision input in context sensitive dialog boxes. The unique modelling

Designed with Bentley civil software, this project by Creighton Manning Engineers features intelligent 3D modelling, machine-controlled grading and stakeless construction and inspection.

capabilities of PowerCivil for Middle East enable users to target known existing features. This allows the model to conform to on ground demands. Colour coding shows potential problem areas as the design develops.

PowerCivil for Middle East offers state of the art design automation. From horizontal alignment, vertical alignment and surface information, the software generates 3D models of the full corridor using predefined typical sections. The software automatically ensures conformance to standards as it speeds the corridor development process. When widening roads, the software automatically creates transitions in numbers and widths of lanes in accordance with user design criteria. Users can interactively edit on the fly. End conditions can be computed at any point in the process.

Users can easily create and modify intelligent design components - without programming – and apply design constraints that offer sleek control of the 3D parametric modelling process. Components can be open or closed shapes and include kerb and gutter sections, footpaths, asphalt and aggregate layers, medians, barriers, slopes and ditches. PowerCivil for Middle East automatically creates surfaces for use in creating cross sections, performing volume calculations and aiding visualisation and rendering. Users can also merge components to create a single design surface or create a model of the entire corridor.

Visual Design Verification

Experience designs real-time with PowerCivil for Middle East constraint-driven templates, context sensitive, intuitive interface, and dynamic 3D modelling. Visualise the design at any time and on demand within the modelling workflow. No translations, software, or special workflow process is needed. Users can virtually drive through the 3D corridor model and visually inspect it for any design deficiencies or physical conflicts. In 3D QA, engineers can fully view road features from all angles to identify gaps or misalignments, look for utility conflicts, and check clearances. They can also visually evaluate sight distance, pavement marking and signing as well as try out multiple aesthetic treatments to reach the desired result. Using PowerCivil for Middle East rendering features – for example, colour fill, shading, lighting and backgrounds – improves the design at any phase and adds a level of assurance in project contractibility.

Comprehensive Results Evaluation

PowerCivil for Middle East provides flexible creation of cross sections from any baseline. View updates on the fly as the design is modified with dynamic cross sections. Grab and move a particular point along the corridor and watch as updates are instantly reflected in the design. With immersive modelling capabilities, view the ground changing to reflect the design changes. Custom cross sections can be cut at skewed angles or broken-back sections, individually or in multiple groupings. The software automatically annotates each cross

section as determined by the user or standard. A full array of civil components can be included in the cross section, including surface features, storm and sanitary structures, roadway components, and notations such as limits or stationing. Users can choose from a variety of volume calculations that greatly enhance accuracy over traditional methods. Sophisticated end-area volume calculations let users determine the level of accuracy based on the frequency that cross sections are cut. Using this method, PowerCivil for Middle East also recognises components in the cross section and accurately computes component volumes. The software offers the flexibility to process volumes based on straight-line or curved alignments. Calculation methods include Triangle Volume from Surfaces, Hybrid Triangle Volume by Station and Volumes by Grid Approximations. PowerCivil for Middle East handles multiple surface types – existing, designed and substratum – and can ignore or void surfaces for calculation.

Storm and Sanitary Network Design

A comprehensive application for surface and wastewater collection systems rounds out PowerCivil for Middle East. PowerCivil for Middle East provides the ability to interactively create a 3D associative model relative to the existing and design ground models as well as road and site geometry. Users can manipulate networks in plan or profile views, displaying not only the PowerCivil for Middle East drainage model but also other utilities modelled in PowerCivil for Middle East. This allows users to plan for clash avoidance and identify potential problem areas before they occur. Users can model, analyse and design complete stormwater and sanitary sewer networks, replete with inlets, culverts, channels, catch basins, manholes, pumps and pipes. A robust set of computation tools account for the full array of surface runoff conditions and perform design checks to ensure conformance with minimum and maximum requirements. Industry standard hydraulic methods are used to analyse and design the systems. Rational, Modified Rational and Soil Conservation Service unit hydrograph modelling and pond routing routines calculate hydrologic impacts for pond sizing and out-flow characteristics. Users can create the full set of hydrographs, drawings and reports.
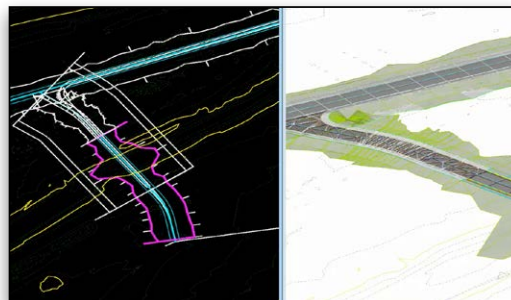
Accelerates design production through repurposing of commonly used 2D and 3D geometric configurations as civil cells.

Project Deliverables

PowerCivil for Middle East makes it easier for users to follow standards than to break them. The result is better quality, consistent documentation in less time, without headaches. In addition, its capability to instantaneously synchronise the model and the representative drawings simplifies and automates the drawing composition process. Since all deliverables adhere to the same project standards and come from the same model, the result is high quality documentation in which the entire project team can be confident. PowerCivil for Middle East provides design, volume, and cross section data in XML industry-standard format for data exchange. Project data can be used in multiple formats, including Excel spreadsheets, HTML or text files, PDFs, printable documents and other output. Reporting tools automate the production of a variety of standard reports, including horizontal and vertical alignments, quantity takeoffs, clearance reports, stakeout, legal descriptions, surfaces and more. PowerCivil for Middle East provides full support to create legal descriptions. The software outputs standard formats for Trimble, TOPCON and Leica for machine controlled grading and machine guidance.

Empowers simple and complex bridge modelling integrated with roadway design.

Accelerated Project Delivery

PowerCivil for Middle East enables engineers and designers to work faster, smarter and more efficiently to help accelerate project delivery with capabilities such as civil cells, design constraints and relationships, design time visualisation and dynamic model updates. Civil cells accelerate design production by using repurposed design layouts. Design, constraint and relational intelligence are maintained between elements to ensure design standards. The software helps reduce production time with dynamic cross section updates reflected throughout the design and modelling process. Dynamic updating ensures that the design automatically stays up to date and eliminates time spent making design edits on older versions of the project.

![Bentley logo] **Bentley®** *Sustaining Infrastructure*